

REMARKS/ARGUMENTS

Claims 1–13 are pending in the application. Claims 3, 4, and 10–13 have been withdrawn. Claims 1, 2, and 5–9 stand rejected. New Claim 14 is added in this paper.

I. Rejections Under 35 U.S.C. § 112

Applicants thank the Examiner for withdrawing the 35 U.S.C. § 112 rejections of Claims 2 and 9, as noted in the Advisory Action mailed October 21, 2005, based on Applicants' amendments filed with the Office Action response mailed October 6, 2005. However, Applicants are perplexed by the Examiner's failure to enter the proposed amendments because the amendment to Claim 9 raises new issues. As can be seen from the following discussion, a capillary element may be inserted into either of the first or second claimed substrate, depending on the type of aperture formed in the first substrate. Thus, it does not appear to Applicants that the amendment to Claim 9 raises new issues.

As described by Applicants on page 13, lines 6–22, an “alignment structure” may serve at least two functions. In a first example, a drill bit or other tool may be inserted into the alignment mark to prevent excessive wandering of the tool during a machining process. In a second example, the mark may function as “a pure alignment mark to facilitate alignment of an overlaying substrate that contains an aperture.”

In the first example, in which a tool is aligned with the alignment structure to form an aperture in the substrate, the aperture formed by the tool may be a reservoir or well fabricated into a channel-bearing substrate (page 12, lines 20–22). Alternatively, the aperture may be a hole formed entirely through a substrate that is used as a junction with an external capillary (page 12, lines 23–25).

Claim 9 as originally presented applied to the first alternative, where the aperture formed by the tool is a reservoir or well in a first substrate, and a capillary is inserted into an aperture in a second substrate, the aperture in the second substrate being positioned to correspond with the reservoir or well in the first substrate layer when the first and second substrate layers are mated together.

In the hope of expediting prosecution by bringing Claim 9 into line with Claim 6, Claim 9 was amended in the previous Office action response to apply to the second alternative, where the aperture is configured to receive a capillary element as recited in Claim 6, i.e., a hole

formed entirely through the first substrate. Applicants refer the Examiner to support provided for this embodiment in the previous Office action response.

Thus, the two versions of Claim 9 apply to two different, but fully supported, embodiments of the present invention. As Applicants are now in the position of requesting continued examination of the present application, new Claim 14 has been added to ensure coverage for both embodiments. New Claim 14 is also consistent with the second example discussed above, in which an alignment structure functions as a “pure alignment mark.” In this embodiment, an alignment mark in a first substrate may be used to drill a hole entirely through a substrate to receive a capillary element, while a “pure alignment mark” on a second substrate guides mating of the first substrate with the second substrate. The claims do not preclude an alignment structure being formed on both the first and the second substrate.

II. Rejections Under 35 U.S.C. § 103(a) as being unpatentable over Harrison et al.
(US 6,224,830)

In the Advisory Action mailed October 21, 2005, the Examiner does not respond to Applicants’ arguments regarding the 35 U.S.C. § 103(a) rejections. Therefore, the arguments are repeated and, in some cases, amplified in the present paper.

Claims 1 and 5–8 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Harrison et al. (US 6,224,830). The rejection of these claims is respectfully traversed.

To warrant rejection under 35 U.S.C. § 103(a), all the claim limitations must be taught or suggested by the prior art. See MPEP § 2142. With regard to claim 1, at a minimum, Harrison et al. do not teach fabricating an alignment structure in a surface of a first substrate layer or aligning a tool with the alignment structure.

The Examiner acknowledges on page 4 of the Office action mailed August 12, 2005, that Harrison et al. do not teach “aligning the drill with an alignment structure in the first substrate” but asserts it would have been obvious to one skilled in the art to use an alignment structure, which the Examiner describes as a fundamental machining technique. Applicants must respectfully disagree that it would be obvious to use this machining technique in a micromachining application. If this were the case, multiple references showing use of the technique in a micromachining arena would be readily available. Applicants are not aware of any such references, and the Examiner has not offered evidence that such references exist. The Examiner has, in effect, taken official notice that the use of an alignment structure for aligning a

tool that is used to form an aperture in a substrate layer of a microfluidic device is well-known. Such official notice unsupported by documentary evidence is appropriate only where the facts asserted to be well-known are capable of “instant and unquestionable demonstration as being well-known.” See MPEP § 2144.03. Applicants do not believe this to be the case. Additionally, it does not appear to Applicants that the Examiner may make an assessment that it would be common sense to use a standard (i.e., macro) machining technique in a micromachining application because an assessment of basic knowledge and common sense that is not based on any evidence in the record lacks substantial evidence support. *Zurko*, 258 F.3d 1379, 1385, 59 USPQ2d 1693, 1697 (Fed. Cir. 2001).

Even if use of the machining technique in a micromachining application were well-known, which does not appear to Applicants to be the case and which Applicants have contested above, Harrison et al. provide no motivation or suggestion to modify their teachings to combine them with the use of an alignment structure for aligning a tool that is used to form an aperture in a substrate layer of a microfluidic device. While Applicants agree with the Examiner that one skilled in the art “would readily appreciate that the micro scale of Harrison’s channels would necessitate [very] accurate drilling,” nowhere do Harrison et al. acknowledge this need or teach ways of meeting the need, simply stating that the capillary should be “centered over” the channel. See, for example, column 11, lines 7–9, 59, and 60.

And, in fact, Harrison et al. offer a solution that both obviates the need for and teaches away from accurate drilling. The problem relating to an aperture in a substrate that is presented and solved by Harrison et al. is that of “a poor fit between the capillary outside diameter and the diameter of the hole in the plate.” See column 11, lines 15–18. The solution is not accurately drilling the hole to provide a better fit, but using a three-plate design, which allows the central plate to act as a washer to prevent glue used to seal the capillary in place from leaking down the outside edge of the capillary and into the flow channel. See column 11, lines 22–28. This solution obviates the need for accurate drilling. Harrison et al. teach away from Applicants’ solution when they state, “While these problems may be overcome with careful manufacturing, an alternative that is easier to manufacture is described here.” See column 11, lines 19–21. The “careful manufacturing” rejected by Harrison et al. would, Applicants believe, include precise drilling of a hole in a plate intended to receive a capillary.

Thus, the Harrison et al. reference neither teaches nor suggests all of the limitations of Applicants’ claim 1. Therefore, claim 1 is nonobvious. Withdrawal of the

rejection of claim 1 under U.S.C. § 103(a) as being unpatentable over Harrison et al. (US 6,224,830) is, therefore, respectfully requested. Claims 2 and 5–9 depend directly from claim 1. Any claim depending from a nonobvious claim is also nonobvious. See MPEP § 2143.03 and *In re Fine*, 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir. 1988). Therefore, dependent claims 2 and 5–9 are nonobvious. Withdrawal of the rejections of these claims is also respectfully requested.

III. Rejections Under 35 U.S.C. § 103(a) as being unpatentable over Harrison et al. (US 6,224,830) in view of Skinner et al. (US 6,605,472)

Claims 1 and 5–8 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Harrison et al. (US 6,224,830) in view of Skinner et al. (US 6,605,472). The rejection of these claims is respectfully traversed.

Applicants have demonstrated above that Harrison et al. provide no suggestion or motivation to combine their teachings with those of others to address the problem solved by Applicants. Even if such a motivation were present, combining the teachings of Harrison et al. with those of Skinner et al. would not teach or suggest all the limitations of Applicants' claim 1.

It does not appear to applicants that Skinner et al. describe a process of drilling a pilot hole that is used in the second drilling step, as described by the Examiner on page 5 of the Office action. Instead, Applicants read Skinner et al. as describing drilling a hole with a conventional conically tipped drill bit and then flattening the bottom of the drilled hole by going in again with a flat tipped drill. See column 10, lines 1–5. The diameters of the two bits appear to be the same in Figures 3a and 3b, with the second drilling step serving only to provide a flat bottom in the previously drilled hole. Thus, the aperture is already formed by the first drill bit, with the second bit merely modifying the base of the aperture. The Examiner was perhaps confused by the depiction of previously etched channel 22 in Figures 3a–c. Channel 22 is filled prior to drilling the hole and thus does not serve as a pilot hole. See column 8, lines 20–22.

Further, as described by Applicants on page 13, lines 10–12, “When a drill bit or other tool is inserted into the alignment mark, the edges of the mark prevent excessive wandering of that tool during the machining process such that the machining process is maintained within a predefined region.” Skinner et al. do not teach any such alignment structure. In column 9, lines 46–57, Skinner et al. make clear that positioning of the drill bit is “eyeballed,” with the drill being raised and the face of the chip being examined to determine if the bit is properly centered.

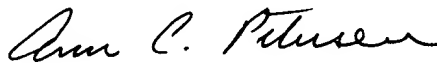
If the hole has been started in the wrong position, the chip is removed from the drilling press, resanded, and a new hole is started. Therefore, Skinner et al. do not teach an alignment structure formed in a surface of a substrate layer whose purpose is to align a tool in order to form an aperture in the substrate with the tool.

The combination of the Harrison et al. and Skinner et al. references neither teaches nor suggests all of the limitations of Applicants' claim 1. Thus, claim 1 is nonobvious over the combination. Withdrawal of the rejection of claim 1 under U.S.C. § 103(a) as being unpatentable over Harrison et al. (US 6,224,830) in view of Skinner et al. (US 6,605,472) is, therefore, respectfully requested. Claims 2 and 5-9 depend directly from claim 1. As any claim depending from a nonobvious claim is also nonobvious, dependent claims 2 and 5-9 are allowable as well. Withdrawal of the rejections of these claims is respectfully requested.

Conclusion

For the foregoing reasons, Applicants believe all the pending claims are in condition for allowance and should be passed to issue. If the Examiner feels that a telephone conference would in any way expedite the prosecution of the application, please do not hesitate to call the undersigned attorney.

Respectfully submitted,

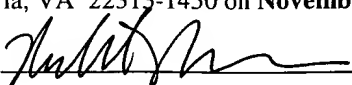


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Signed:  _____